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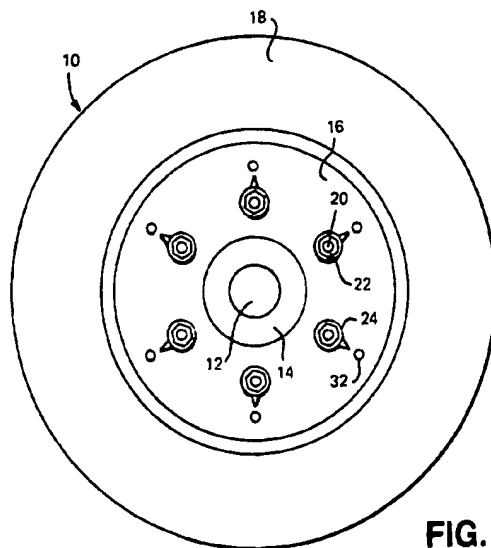
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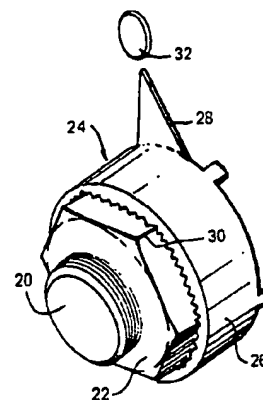
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(54) **Looseness indicator for fasteners**

(57) A safety indicating device (24) to indicate whether or not a vehicle wheel nut (22) has become loose on its stud (20), comprises a body (26) and a pointer (28). The body (26) has grooves (30) enabling the device (24) to be releasably secured to a nut (22) so that the pointer (28) points towards a reference mark (32).

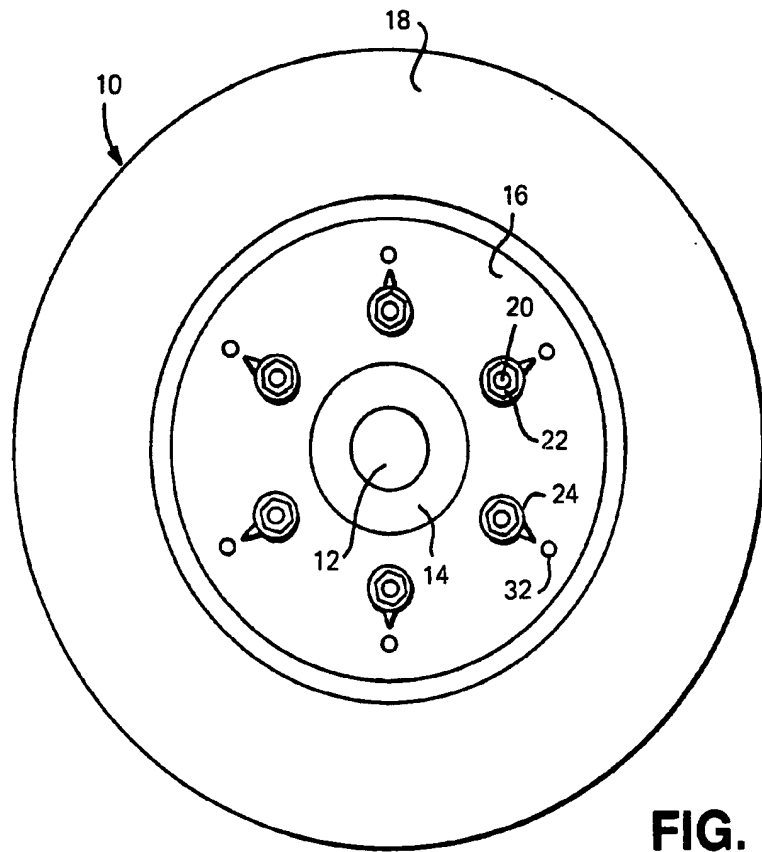


**FIG. 1**

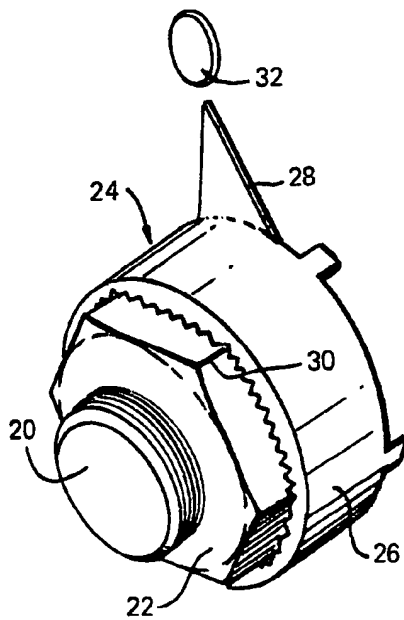


**FIG. 2**

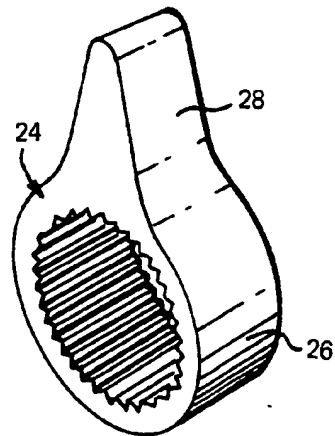
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**FIG. 1**



**FIG. 2**



**FIG. 3**

# A SAFETY INDICATING DEVICE

The present invention relates to a safety indicating device. The invention is particularly directed towards a safety indicating device for use with vehicle wheels.

A common method of attaching a vehicle wheel to a rotating hub is to provide a number of fixed threaded studs on the rotatable hub and to attach the wheel to the hub by means of nuts engaging the studs, the studs passing through appropriately spaced openings in the wheel.

It is not uncommon for one or more of the wheel nuts to work loose whilst the vehicle is in use so that the wheel can move relative to the hub creating a dangerous and unsafe driving condition.

Whilst a visual inspection on a regular basis is recommended by the vehicle manufacturer, visual inspection does not always readily reveal that one or more of the nuts is working loose particularly if the nut has only moved by a small amount relative to the stud.

The present invention seeks to provide a relatively simple means enabling visual inspection to be carried out so as to indicate whether or not a wheel nut has become loose or is starting to become loose.

Accordingly the present invention provides a safety indicating device for indicating displacement between a first fixed member and a second member rotatably attached to the first member, the device comprising engagement means enabling the device to be releasably secured to the second member, and indicating means to indicate the position of the device relative to a reference.

The engagement means can comprise a plurality of equispaced grooves and the indicating means can comprise a pointer.

The indicating device can comprise a body having a bore formed with equispaced grooves and a pointer formed integrally with the body.

The body and the pointer can be moulded in one piece, or extruded so that the body and the pointer both have the same thickness.

A device according to the present invention is particularly useful for indicating whether or not a wheel nut has become loose so that the first member comprises a threaded stud and the second member comprises a wheel nut.

The reference can comprise a datum point, a line, or the indicating means of other safety indicating devices.

The datum point can comprise a fluorescent spot adjacent each stud

hole on a vehicle wheel.

The present invention further comprises a vehicle wheel and hub assembly comprising studs on the hub and associated nuts securing the vehicle wheel to the hub, an indicating device being secured to each nut and arranged on each nut when tightened, so that each device points to a reference.

The present invention will now be more particularly described with reference to the accompanying drawing in which,

Fig. 1 shows a side elevation of a vehicle wheel including a number of indicating devices according to the present invention,

Fig. 2 shows a perspective view of one of the indicating devices illustrated in Fig. 1 in more detail, and

Fig. 3 shows an alternative form of indicating device to that shown in Fig. 2.

Referring to Fig. 1 there is shown a vehicle wheel assembly 10 comprising an axle 12, a hub 14, and a rim 16 on which a tyre 18 is mounted. The hub 14 has six threaded studs 20 which pass through openings in the rim 16, and the rim 16 is secured to the hub 14 by nuts 22. A safety indicating device 24 is attached to each nut 22

as shown in more detail in Fig. 2.

The device 24 comprises a body 26 having a pointer 28. The body 26 has a central bore which is provided with a number of equispaced grooves or splines enabling the device 24 to be secured to the nut 22 by engagement between the corners of the nut and respective ones of the grooves 30.

Each device 24 can include a reference in the form of a mark 32 on the rim 16. The mark 32 can be painted onto the rim or stuck to the rim, and the mark can be fluorescent.

The bore in the body 26 and the splines 30 are sized so that the device is a force fit on each nut 22 so that the device will not become loose during use but can be released from the nut when necessary.

In order to use the device as illustrated in Figs. 1 and 2, the rim 16 and therefore the tyre 18 is attached to the hub 14 in the usual way and all of the nuts 22 are tightened to the necessary degree of tightness. A device 24 is then attached to each wheel nut so that each pointer 28 points to its respective reference mark 32.

It will be appreciated that if there is any relative movement between any one of the nuts 22 and studs 20 the pointer 28 will

not be pointing towards its reference mark 32. Therefore the device according to the present invention provides a visual indication if the nut to which it is attached, has become loose without the need to jack the vehicle wheel and to test each nut for tightness by hand or by using a tool.

Whilst in the illustrated embodiment of the invention all of the pointers are directed radially outwardly, they can be directed in any direction which may be appropriate. For example, all of the pointers can point in a number of random directions provided that when the device is attached to a tightened nut the pointer will be directed towards a reference mark so that displacement between the pointer and the reference mark can be visually noted.

The mark 32 can be omitted, and the pointers can be directed in a common direction, eg all parallel to one another, or all radially outwardly or inwardly, so that if one or more of the wheel nuts became loose, the displacement of the safety devices is readily noted by the eye.

Fig. 3 shows an alternative form of indicating device of generally the same form to that shown in Fig. 2 except that instead of the device being formed by a moulding it is formed by an extrusion process, the thickness of the pointer 28 being the same as the thickness of the body 26.

If it is required to tighten a wheel nut the device 24 can be removed from the nut by applying leverage between the device and the wheel rim or applying a pulling load to the device 24 to remove the device from the nut. After tightening has taken place the device is replaced so that the indicator 28 is pointing towards the reference mark 32. If it is not possible when replacing the device for the pointer 28 to point directly to the reference point 32 the reference mark can be removed from its existing position and relocated so that the pointer 28 is directed towards it.



CLAIMS

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- 1 A safety indicating device for indicating displacement between a first fixed member and a second member rotatably attached to the first member, the device comprising engagement means enabling the device to be releasably secured to the second member and indicating means to indicate the position of the device relative to a reference.
- 2 A device as claimed in claim 1 in which the engagement means comprises a plurality of equispaced grooves.
- 3 A device as claimed in claim 1 or claim 2 in which the indicating means comprises a pointer.
- 4 A device as claimed in any one of the preceding claims in which the device comprises a body having a bore formed with equispaced grooves and a pointer formed integrally with the body.
- 5 A device as claimed in claim 4 in which the body and the pointer have the same thickness.
- 6 A device as claimed in any one of the preceding claims in which the first member comprises a threaded stud and the second member comprises a nut.
- 7 A device as claimed in any one of the preceding claims in

which the reference comprises a datum point locatable with respect to the indicating means.

- 8 A device as claimed in claim 7 in which the datum point comprises a mark on a structure to be secured between the first and second members.
- 9 A device as claimed in claim 8 in which the mark is fluorescent and the device is fluorescent.
- 10 A safety indicating device constructed and arranged for use and operation substantially as herein described.
- 11 A vehicle wheel and hub assembly, the wheel being secured to the hub by means of fixed threaded studs on the hub extending through holes in the wheel and nuts on the studs clamping the wheel to the hub, each said nut including a safety indicating device as claimed in any one of the preceding claims 1 - 10.
- 12 A vehicle wheel and hub assembly constructed and arranged for use and operation substantially as herein described.